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Social-ecological Impact Evaluation on Eco-environmental Policies Associated Western China Development

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Abstract

The ecological and social effects of three major eco-environment policies associated with Western China Development, i.e., Program of Returning Cultivated Lands into Forest and Grassland (RCLFG), Natural Forest Protection Project (NFPP) and Grassland Ban Program (GBP) were evaluated by collecting census data and referring the literatures in this study. The results indicate that these policies have greatly improved eco-environment in western China through facilitating structural adjustment of industries in the rural regions and exerting great impacts on the livelihoods of local farmers. In order to maintain the sustainable development of eco-environment in Western China, it was suggested that long-term subsidy policy should be created. The eco-policies need to be amended according to the problems found in practices to keep the eco-policies going efficiently and smoothly.

Keywords: Western China; Eco-environmental Policies; assessment; social-ecological benefits

1 Introduction

Western China Development (WCD), an unprecedented strategy launched by the central government in 2000 to ensure the sustainable development of western China by injecting financial aid and offering favorable policies to speed up infrastructure construction, environmental protection and poverty eradication in this region [1]. Under this strategy, three major environment conservation programs, Natural Forest Conservation Program (NFCP) or Natural Forest Protection Program (NFPP, experimented in 1998 and launched in 2000), Grain to Green Program (GTGP) or Program of Returning Cultivated Lands into Forest and Grassland (PRCLFG, experimented in 1999, launched in 2002), and Grassland Ban Program (GBP) or Program of Returning Grazing Pasture to Native Grassland (PRGPAG,

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experimented in 2001-2002, launched in 2003) was formulated by central government to address the pressing environment problems in China. Although these three programs were different in their action plans, i.e., the NFCP was designed to conserve natural forests through logging bans and afforestation with incentives to forest enterprises, the GTGP was deliberated to covert cropland on steep slopes to forest and grassland by providing farmers with grain and cash subsidies, and the GBP was planned to restore the degraded grassland through grazing ban and rearing livestock in sheds by providing with grain and cash subsidies, they were similar in the objectives, i.e., promoting the sustainable development of ecological and socio-economic environments in western China.

After 10 year's implementation of these eco-environmental policies in western China, the impacts of these eco-polices should been assessed by both policy-makers and third body. Although some professional concluded solely through qualitative studies or perceptive observation that these ecological construction programs have already brought substantial ecological and socioeconomic impacts since they have been initiated [2], few literatures have documented the quantitative analysis of environmental, socio-economic implications of these programs. Therefore, up-to-date and quantitative information were collected from different source in this study to illustrate the effectiveness of these programs in the relatively short time since NFCP, GTGP and GBP, and to forward recommendations to overcome the programs' weakness and promote their strength in the long run.

2 Data collection and processing

Through searching and collecting the statistic data from the public yearbook, census and government bulletin distributed by various source departments including Ministry of Agriculture of the People's Republic of China, State Forestry Administration of the People's Republic of China, National Bureau of Statistics of the People's Republic of China, Ministry of Civil Affairs of the People's Republic of China, National Development and Reform Commission the People's Republic of China as well as the provincial offices of corresponding departments in the Western China. Moreover, the literatures, reports and documents related to this study are reviewed as the references to cross-check the primary information and data we obtained and collected. The descriptive analysis and systematic techniques proposed by the previous researchers were applied for data and information processing.

3 Results

2.1 Ecological Benefits

With the implementation of eco-construction policies, especially the NFCP, GTGP, the forest resources in both western China and whole nation were promoted greatly when compared the data of China Forestry Statistical Yearbook between 1998 and 2003. The increment rates of forest area and coverage in western China were 46.83% and 38.87% respectively, much higher than those in whole country, 10.05% and 10.03% accordingly. Among all the provinces/regions in Western China, Qinghai showed the peak increment of both forest area and forest coverage with 927.2% and 923.26% of growth rates between 1998 and 2003, while Shanxi had the lowest increment of forest area and forest coverage, with only 13.24% and 13.25% of growth rate respectively. Tibet took the leading position in the increment of forest stock volume by showing 80.90% of growth rate, though Shanxi was numbered the last province

in increment of forest stock volume by giving only 1.69% of growth rate. The increment of forest area, cover and stock volume in western China was highly related to logging ban and afforestation initiated by the eco-construction policies of NFPP and PRCLFG.

According to data recorded by State Forestry Administration of China, NFPP was initiated in 1998 and spread to all over the country in year 2000. By the end of 2008, the West has built 8,702,600 ha communal forests, including 1,295,800 ha manmade forests, 2,981,300 ha air-seeded forests and 4,425,500 ha rest forests. As a result, the forest resources in Western China were greatly improved after the eco-construction policies was implemented (Table 1). As the forests can provide multiple functions, such as soil erosion control, carbon sequestration, biodiversity conservation, eco-tourism and recreation etc. [3-6], the soil loss areas have been reduced and vegetation biomass and biological diversity have been improved year by year after the implementation of these eco-policies (Table 1).

Table 1 Forest Resources in China before and after the implementation of Eco-construction policies*

Region/Province	Forest area (10,000 ha.)		Forest coverage (%)		Forest stock volume (10,000 m3)	
	In 1998	In 2003	In 1998	In 2003	In 1998	In 2003
Whole China	15894.09	17490.92	16.55	18.21	1126659.14	1245584.58
West Region	6717.77	9863.78	9.03	12.54	ND	ND
Inner Mongolia	1474.85	2050.67	12.73	17.7	98163.48	110153.15
Guangxi	816.66	983.83	34.37	41.41	27699.92	36477.26
Chongqing	1330.15	183.18	23.50	22.25	144621.65	8441.08
Sichuan		1464.34		30.27		149543.36
Guizhou	367.31	420.47	20.81	23.83	14050.18	17795.72
Yunnan	1287.32	1560.03	33.64	40.77	128364.94	139929.16
Tibet	408.15	1389.61	ND	11.31	125337.41	226606.41
Shanxi	592.03	670.39	28.74	32.55	30265.74	30775.77
Gansu	217.41	299.63	4.83	6.66	17201.76	17504.33
Qinghai	30.88	317.2	0.43	4.40	3270.36	3592.62
Ningxia	14.64	40.36	2.20	6.08	585.26	592.85
Xinjiang	178.37	484.07	1.08	2.94	25401.95	28039.68

* Data sources: State Forestry Administration, *China Forestry Statistical Yearbook, 2004.*
Note: ND, no data; Chongqing belonged to Sichuan Province before June of 1997, and the forest data in this manuplaity in 1998 was not separated from Sichuan province.

The RCLFG was initiated in Sichuan, Shanxi and Gansu provinces in 1999, when 447933 ha forest areas were returned and 381467 ha cultivated land was transformed into forest and grasslands [7]. According to data from the RCLFG Office, Western China has been supposed to return 15,400,000 ha forest and grassland, including 6,466,667 ha cultivated land and 8,933,333 ha bare land have been transformed to forests and grasslands. Although the RCLFG has greatly promoted afforestation by both the government and civil societies, afforestation rate was slowed down after the peak year of 2003 when the national strategy was prioritized from rural development of Western China to industry base promotion of Northeastern China.

2.2 Social Benefits

Local livelihood was diversified with the implementation of eco-policies in Western China. As shown in Fig. 1, the population of traditional farmers decreased while migration labor in rural Western China increased during 1997-2005. And the population engaged in construction, industry and other non-agriculture industries was rising. Consequently, the pressures on farming land, pasture land and forests would be greatly relieved and western eco-environments would be substantially improved. The increase of financial inputs for education have greatly reduced the illiteracy in rural Western China (Table 2). The medical conditions in rural Western China were improved greatly, showing the increased bed numbers in the hospitals shown in Table 3. Moreover, the infrastructure construction such as railway, high way and expressway, has been greatly developed from year 2001 to 2006 in Western China. It is clear that social benefits brought by the eco-policies can boost rural livelihoods including education, medical conditions and sufficient energy supply.

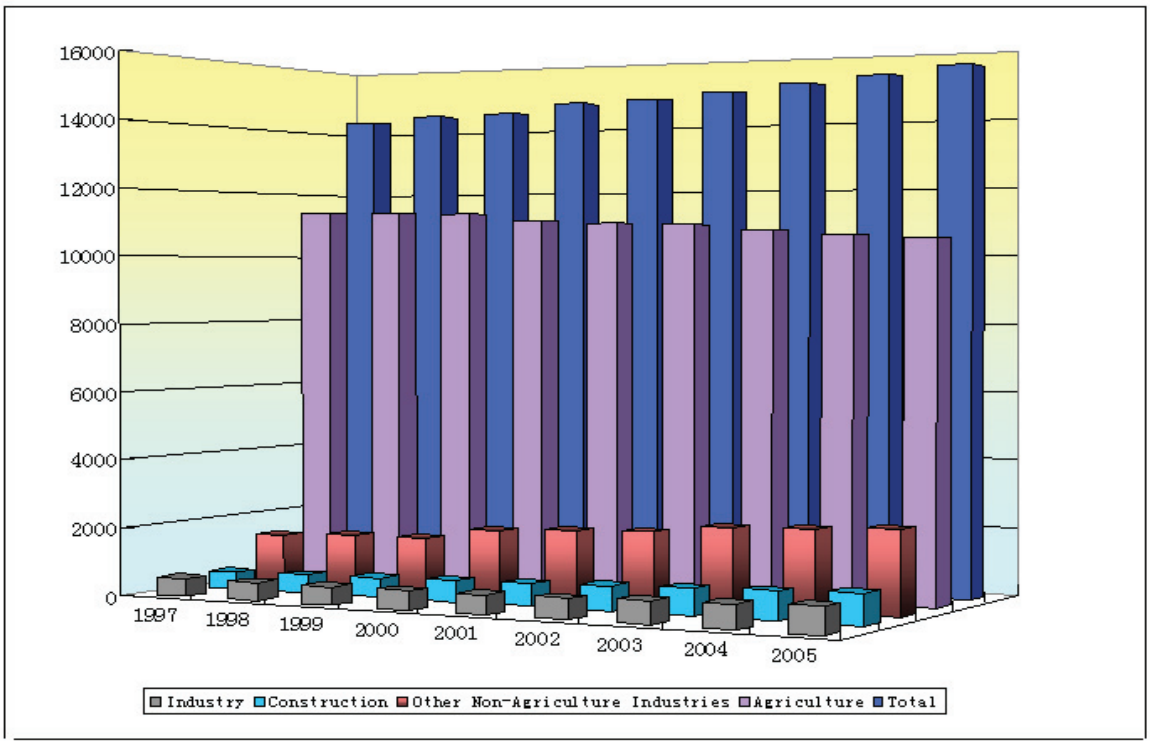

Figure 1 Rural labor migration (10,000 persons) in Western China 1997-2005
Data sources: National Statistical Bureau, *Rural Regions Statistical Report in Western China*; National Bureau of Statistics of China, *China Statistical Yearbook*.

Table 2 Illiterate Rate (%) referred to people of 15 years old and over in Western China 1997-2007

	1997	1998	1999	2001	2002	2003	2004	2005	2006	2007
China	16.36	15.78	15.14	9.08	11.63	10.95	10.32	11.04	9.31	8.4
Inner Mongolia	16.78	15.83	16.44	11.59	13.46	13.67	10.46	11.25	9.36	8.23
Guangxi	15.12	13.32	12.35	5.3	9.45	8.85	8.09	8.64	6.01	5.82
Chongqing	16.82	15.45	14.75	8.9	10.31	8.40	12.28	11.65	9.7	8
Sichuan	18	15.7	16.77	9.87	13.55	11.73	11.53	16.61	12.56	10.62

Guizhou	25.88	28.98	24.46	19.85	18.74	19.68	16.98	21.41	18.79	16.59
Yunnan	25.22	25.48	24.34	15.44	23.1	21.50	16.37	20.07	16.5	16.13
Tibet	54.08	59.97	66.18	47.25	43.82	54.86	44.03	44.84	45.65	36.77
Shanxi	17.34	16.52	18.29	9.82	15.56	11.91	10.56	10.33	9.35	8.89
Gansu	26.77	28.65	25.64	19.68	21.11	20.33	19.42	20.83	22.27	19.33
Qinghai	43.62	42.92	30.52	25.44	24.77	23.45	22.08	24.07	19.3	18.4
Ningxia	25.83	25.56	23.32	15.72	17.49	17.57	15.65	18.71	15.44	13.8
Xinjiang	11.52	11.44	9.77	7.72	8.21	6.94	7.05	8.32	6.66	4.29

Data sources: National Bureau of Statistics of China, *China Statistical Yearbook*.

Table 3 Hospital Beds (10,000 beds) in Western China 2000-2007

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Inner Mongolia	6.32	6.31	6.5	6.04	6.07	6.94	7.03	7.38
Guangxi	8.3	8.56	8.32	8.13	8.32	8.7	9.7	9.5
Chongqing	6.57	6.5	6			6.44	6.49	7.09
Sichuan	17.08	9	18.7			20.2	19.5	21
Guizhou	5.86	5.91	5.76		5.81	6		6.71
Yunnan	9.75	9.98	10.13		9.54	9.88	11.05	11.9
Tibet	0.62	0.64	0.61	0.62	0.42	0.68	0.75	0.75
Shanxi	9.26	9.9	10	9.57	9.63	10.67	11.12	11.78
Gansu	5.66	5.7	2.98	5.69	5.8	5.99	6.25	6.59
Qinghai	1.65	1.57	1.6	1.62	1.61	1.6	1.6	1.55
Ningxia	1.62	1.44	1.48	1.57	1.68	1.78	1.83	1.89
Xinjiang	6.59	6.6	6.5	6.49	7.4	7.98	8.37	

Data sources: Inner Mongolia Autonomous Region Bureau of Statistics, *Inner Mongolia Statistical Yearbook.*

3 Discussion

Improving and protecting the eco-environment in Western China is vital not only for improvement of eco-security in this region, but also for sustainable development of whole China. With the implementation of eco-construction policies in western China in past 10 years, forest and grassland resources have been greatly increased and their ecological functions have been significantly promoted. With increased ecological functions, the production values of industry and agriculture (i.e. farming, forestry, pastoralism) have been also greatly improved. Moreover, there were more job opportunities for local farmers, such as migration labors, business and other industries. It is clear that eco-policies in Western China have played important roles in improving eco-environmental and promoting the local livelihoods

Globally, United States and some European countries once implemented some ecological construction projects and gained the remarkable results of eco-environmental improvement. One of the most significant projects was Conservation Reserve Program (CRP), supported by Food Security Act since 1985 in US. More than 20 billion

dollars had been invested by the government during 1985-2000, with 1.8 billion dollars average every year, to provide financial assistance for farmers who returned the cultivated lands into natural reserves. Thus, since 1985 in US, loss of soil was dropped by 22%, approximately 0.7 billion ton every year. Both water quality and biodiversity have been greatly improved. As for European countries, different measures of eco-constructions have been implemented, such as long-term subsidy for agreed farmers in UK, enforcing legislation and administration in Italy [8]. During 1956-1983, farming lands in Europe have decreased by 11 million ha, about 8% of the whole cultivated lands and forest cover areas have increased by 15% due to ecological construction programs.

The appraisals of the eco-policies worldwide are generally focused on changes in social and economic development, cost-benefit in sustainable development[8, 9]. As for Chinese eco-policies, some researchers have assessed RCLFG in economic, social and ecological dimensions via case studies including on-the-spot investigation or questionnaire surveys or census data analysis [7, 10-13]. The common conclusions from these case studies were those eco-policies implemented have brought the positive effects in ecological, social and economic dimensions. To maintain the sustainable development of eco-environment in Western China, it is was suggested that long-term subsidy policy should be created and the achievement of eco-environment construction projects should be constantly monitored by comparing the current situation with the targets set at the beginning.

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